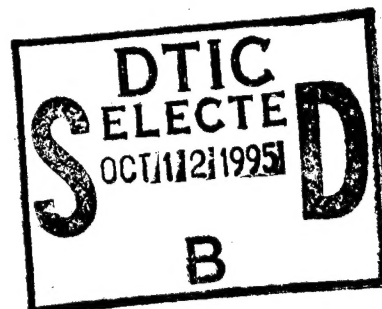


**SATELLITE AND SPACE SHUTTLE EXPERIMENTS FLOWN BY
THE GEOPHYSICS DIRECTORATE AND OTHER UNITS OF
PHILLIPS LABORATORY AT HANSCOM AFB, MA AND BY
THEIR PREDECESSOR ORGANIZATIONS, 1958 - 1994.**

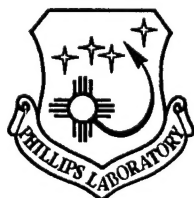
Ruth P. Liebowitz

16 January 1995



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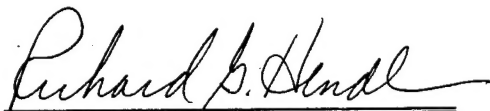
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**PHILLIPS LABORATORY
Directorate of Geophysics
AIR FORCE MATERIEL COMMAND
HANSCOM AIR FORCE BASE, MA 01731 - 3010**

DTIC QUALITY INSPECTED 5

This technical report has been reviewed and is approved for publication.

A handwritten signature in cursive script, reading "Richard G. Hendl", written in dark ink. The signature is fluid and stylized, with a long horizontal stroke at the end.

(Signature)

Dr. Richard G. Hendl
Chief Scientist

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Satellite and Space Shuttle Experiments
Flown by the
Geophysics Directorate and Other Units of Phillips Laboratory
at Hanscom AFB, MA.
and by
Their Predecessor Organizations
1958 - 1994

Compiled by
Dr. Ruth P. Liebowitz
Historian
Phillips Laboratory
Hanscom AFB, MA.

Preface

This report contains a comprehensive listing of space experiments conducted since 1958 by the Geophysics Directorate and other units of Phillips Laboratory at Hanscom AFB, MA, and their predecessor organizations. It marks the first time the satellite and Space Shuttle experiments of these organizations have been collected in one volume.

The listing is intended to provide a summary guide to the Directorate's long-standing and broad-ranging programs of orbital space probes. Experiments have measured electromagnetic radiation and high-energy particles coming in from the sun, the characteristics of near-Earth space, and phenomena at lower altitudes or at the Earth's surface that are accessible from a space platform, to mention some of the major program areas.

In the late 1940s and early 1950s the original Geophysics Research Directorate built up expertise in probe instrumentation and experimental practice through its sounding rocket program. This expertise was transferred to satellites in the late 1950s. The organization, which then became the Air Force Cambridge Research Laboratories, managed a series of research orbiting vehicles in the mid-1960s and built two of them (OV 3-5 and OV 3-6) completely in-house. However, most of its space experiments have "piggybacked" rides on a variety of satellites flown by DOD and also by NASA.

Since the early 1980s Air Force geophysicists have also flown experiments on the new Space Shuttle. All told, the number of satellite experiments flown by these Hanscom organizations and their predecessors totals more than 350 and the number of Space Shuttle experiments reaches 50.

In this report, the summary of Space Shuttle programs is preceded by the much longer satellite listing. Readers who seek detailed information on launch sites, vehicles, orbits, etc. are referred to the TRW Space Log.

The historian appreciates the help received from many scientists and engineers in checking the accuracy of the entries. Ms. Evelyn Kindler edited and formatted the information to create the final copy, and her contribution is gratefully acknowledged.

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RPL
Hanscom AFB, MA
November 1994



AFCRL staff prepare the ATCOS II satellite (OV3-6) for pre-flight testing, 1967.

AFCRC/AFCL/AFGL/Phillips Lab - Hanscom Satellite Experiments
1958 - Present*

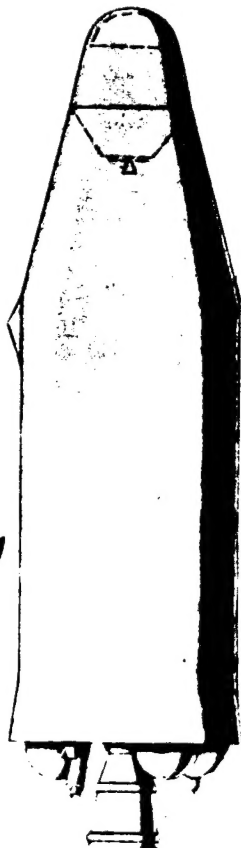
* As of November 1994

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------------------|---------|-------------|---|---|
| 1 Feb 1958 | Explorer I (1958-Alpha) | USA | | Micrometeorite Detector (Microphone) | Atlantic Missile Range (AMR) Launch Success |
| 26 Mar 1958 | Explorer III (1958-Gamma) | USA | | Micrometeorite Detector (Grid) | AMR Launch Success |
| 11 Oct 1958 | Pioneer I (1958-Eta) | NASA | | Micrometeorite Detector | AMR Launch Success |
| 13 Apr 1959 | Discoverer 2 (1959-Gamma) | ARPA | | Cosmic Ray Emulsions | Western Test Range (WTR) Launch Failure No Capsule Recovery |
| 25 Jun 1959 | Discoverer 4 | ARPA | | Cosmic Ray Emulsions | WTR Launch Vehicle Failure |
| 13 Aug 1959 | Discoverer 5 (1959-Epsilon) | ARPA | | Cosmic Ray Emulsions | WTR Launch Failure No Capsule Recovery |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

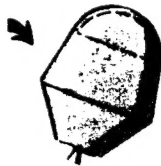
| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-------------------------------|---------|---|--|---|
| 19 Aug 1959 | Discoverer 6 (1959-Zeta) | ARPA | | Cosmic Ray Emulsions | WTR Launch Failure No Capsule Recovery |
| 20 Nov 1959 | Discoverer 8 (1959-Lambda) | USAF | | Cosmic Ray Emulsions | Failure No Capsule Recovery |
| 4 Feb 1960 | Discoverer 9 | USAF | H. Yagoda | Cosmic Ray Emulsions | Failure No Orbit |
| 26 Feb 1960 | Midas I | USAF | D. Smart J. McIsaac R. Soberman R. Sagalyn | Cosmic Radiation Monitor Aerospace Density Micrometeorite Detectors (Acoustic & Grid) Plasma Probe (Electric Field Meter) | Vehicle Failure |
| 11 Mar 1960 | Pioneer V (1960-Alpha) | NASA | R. Soberman | Micrometeorite Detector (Microphone) | Inconclusive Data |
| 15 Apr 1960 | Discoverer 11 (1960-Delta) | USAF | R. Soberman | Micrometeorite Detector (Microphone) | Failure No Capsule Recovery |
| | | | | | |

DISCOVERER II



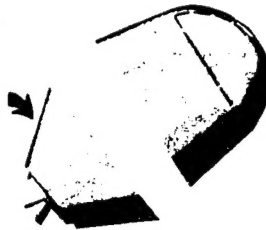
Discoverer II in orbit. The re-entry vehicle 1 is outlined by the dotted lines.

RE-ENTRY VEHICLE



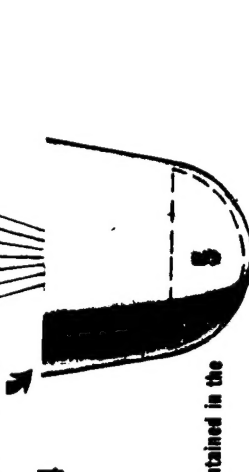
Re-entry vehicle after separation from Discoverer II.

AFTER STRUCTURE



The after structure which contains the expanded retrorocket separates just prior to re-entering the earth's atmosphere.

RE-ENTRY VEHICLE



The re-entry vehicle is supported by the parachute during the final phase of its descent.

Environmental package is contained in the re-entry vehicle cavity.

RECOVERY CAPSULE DISCOVERER SATELLITES

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---------------------------------|---------|---|---|--|
| 24 May 1960 | Midas 2 (1960-Zeta) | USAF | D. Smart J. McIsaac A. Jursa R. Soberman R. Sagalyn | Cosmic Radiation Monitor Aerospace Density (Density Gauge) Radiometric Measurements Micrometeorite Detectors (Acoustic & Grid) Plasma Probe (Electric Field Meter) | Loss of Telemetry on 2nd Day Data Received Up to Telemetry Failure |
| 10 Aug 1960 | Discoverer 13 (1960-Theta) | USAF | H. Yagoda R. Soberman | Cosmic Ray Emulsions Sputtering Measurements | Failure No Capsule Recovery |
| 13 Sep 1960 | Discoverer 15 (1960-Mu) | USAF | H. Yagoda | Cosmic Ray Emulsions | Failure No Capsule Recovery |
| 26 Oct 1960 | Discoverer 16 | USAF | H. Yagoda | Cosmic Ray Emulsions | No Orbit |
| 12 Nov 1960 | Discoverer 17 (1960-Omichon) | USAF | H. Yagoda | Cosmic Ray Emulsions | Successful Capsule Recovery (10th Try for Experiment) Discovered Heavy Solar Cosmic Rays |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-------------------------|---------|---|--|---|
| 7 Dec 1960 | Discoverer 18 | USAF | H. Yagoda | Cosmic Ray Emulsions | Success Discovered Protons in Trapped Radiation Measured Energy Spectrum |
| 31 Jan 1961 | Samos 2 (1961-Alpha 1) | USAF | R. Soberman R. Soberman | Micrometeorite Detectors (Acoustic-3) Micrometeorite Detectors (Grid-2) | Success |
| 16 Jun 1961 | Discoverer 25 (1961-Xi) | USAF | H. Yagoda D. Smart J. McIsaac R. Soberman | Cosmic Radiation (Nuclear Emulsions & Metals) Cosmic Ray Monitor Aerospace Density (Gauge-2) Micrometeorite Detector Acoustic & Grid) | Success Partial Success Failure |
| 7 Jul 1961 | Discoverer 26 (1961-Pi) | USAF | H. Yagoda D. Smart L. DellaLucca J. Ulwick | Cosmic Radiation (Emulsions) Cosmic Ray Monitor Micrometeorite Detectors (Acoustic & Grid) Galactic Radio Noise | Success Partial Failure Partial |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-----------------------------|---------|---|---|--|
| 12 Jul 1961 | Midas 3 (1961-Sigma) | USAF | D. Smart H. Hinteregger A. Jursa L. DellaLucca | Cosmic Ray Monitor Retarding Potential Analyzer Radiometers (Infrared) Micrometeorite Detector (Membrane) | First WTR Launch Partial Partial Failure Success No Impacts |
| 3 Aug 1961 | Discoverer 28 | USAF | D. Smart L. Katz J. McIsaac | Cosmic Ray Monitor Cosmic Ray Monitor Aerospace Density (Gauge-2) | Vehicle Failure No Orbit |
| 30 Aug 1961 | Discoverer 29 (1961-Psi) | USAF | L. Katz H. Yagoda | Cosmic Ray Monitor Cosmic Radiation (Metal Samples) | Partial Success |
| 9 Sep 1961 | Samos 3 | USAF | R. Soberman B. Shuman R. Sagalyn L. Katz J. McIsaac | Micrometeorite Detectors (Acoustic, Grid, & Microphone) Magnetic Fields (Magnetometer) Plasma Probe (Electric Field Meter) Neutron Albedo Aerospace Density (Gauges-2) | Exploded on Launch Pad |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-------------------------------|---------|-----------------------------------|---|--------------------------------|
| 12 Sep 1961 | Discoverer 30 (1961-Omega) | USAF | H. Yagoda J. Ulwick | Cosmic Radiation (Metal Samples) Galactic Radio Noise | Success Partial |
| 17 Sep 1961 | Discoverer 31 (1961-AB) | USAF | L. Katz H. Yagoda J. Ulwick | 1.5 Mev Extraterrestrial Protons Cosmic Radiation (Emulsions & Metals) Galactic Radio Noise | Failure No Capsule Recovery |
| 13 Oct 1961 | Discoverer 32 | USAF | H. Yagoda R. Sagalyn | Cosmic Radiation (Emulsions & Metals) Electron Ion Density (Plasma Probes) | Success Success |
| 21 Oct 1961 | Midas 4 | USAF | L. Katz | Cosmic Radiation (HEP-2 Instruments) | Success |
| 23 Oct 1961 | Discoverer 33 | USAF | H. Yagoda | Cosmic Radiation (Emulsions & Metals) | Failed to Orbit |
| 5 Nov 1961 | Discoverer 34 | USAF | H. Yagoda J. Ulwick | Cosmic Radiation (Emulsions & Metals) Spatial & Temporal Electron Density Variations | Capsule Not Ejected Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---------------------------------|---------|--|---|---|
| 15 Nov 1961 | Discoverer 35 | USAF | H. Yagoda A. Jursa | Cosmic Radiation (Emulsions & Metals) Radiometric Measurements (2 Sensors) | Success Partial |
| 12 Dec 1961 | Discoverer 36 | USAF | H. Yagoda L. Katz L. Katz J. Ulwick | Cosmic Radiation (Emulsions & Metals) Cosmic Ray Monitor (CRM-9A) Cosmic Ray Monitor (CRM-8A) Spatial & Temporal Electron Density Variations | Success Experiment Failure Partial Success |
| 27 Feb 1962 | Discoverer 38 (1962-Epsilon) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions & Metals) | Success |
| 9 Apr 1962 | Midas 5 (1962-Kappa) | USAF | D. Smart L. Katz H. Yagoda A. Jursa | Cosmic Ray Monitor High Energy Protons Emulsions & Metals-Cosmic Radiation Infrared Radiometric Measurements | Success Success Success Partial |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------------|--------------|---|--|---|
| 18 Apr 1962 | No Name (1962-Lambda) | USAF | H. Yagoda L. Katz J. Ulwick A. Jursa | Cosmic Radiation (Nuclear Emulsions) Neutron Albedo Measurements Spatial & Temporal Electron Density Variations Infrared Radiometric Measurements | Success Success Success Failure |
| 26 Apr 1962 | Samos 7 | USAF | H. Yagoda L. Katz H. Hinteregger J. Ulwick A. Jursa | Cosmic Radiation (Nuclear Emulsions) Neutron Albedo Measurements Retarding Potential Analyzer Spatial & Temporal Electron Density Variations Infrared Radiometric Measurements | Success Success Partial Partial Failure |
| 10 May 1962 | ANNA 1A | DOD/ NASA | O. Williams | Project ANNA 1A (Geodetic Satellite) | Failure to Orbit |
| 15 May 1962 | No Name (1962 Sigma) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-----------------------|---------|---|---|---|
| 30 May 1962 | No Name (1962 Phi) | USAF | H. Yagoda H. Hinteregger R. Sagalyn L. Katz J. Ulwick | Cosmic Radiation (Nuclear Emulsions & Metals) Retarding Potential Analyzer Ion & Electron Measurements Beta-Gamma Measurements Electron Density (Impedance Probe) | Success Payload Failure Success Success Payload Failure |
| 2 Jun 1962 | No Name (1962-Chi) | USAF | H. Hinteregger J. Ulwick R. Sagalyn H. Yagoda L. Katz | Retarding Potential Analyzer Impedance Probe Ion & Electron Measurements Cosmic Ray Studies (Emulsions & Metals) Beta-Gamma Measurements | Partial Success Success Success Success Success |
| 23 Jun 1962 | No Name (1962-AB) | USAF | J. Ulwick R. Sagalyn L. Katz L. Block | Impedance Probe Measurements Ion & Electron Measurements Beta-Gamma Measurements Infrared Measurements of Agena Plume | Success Success Success Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

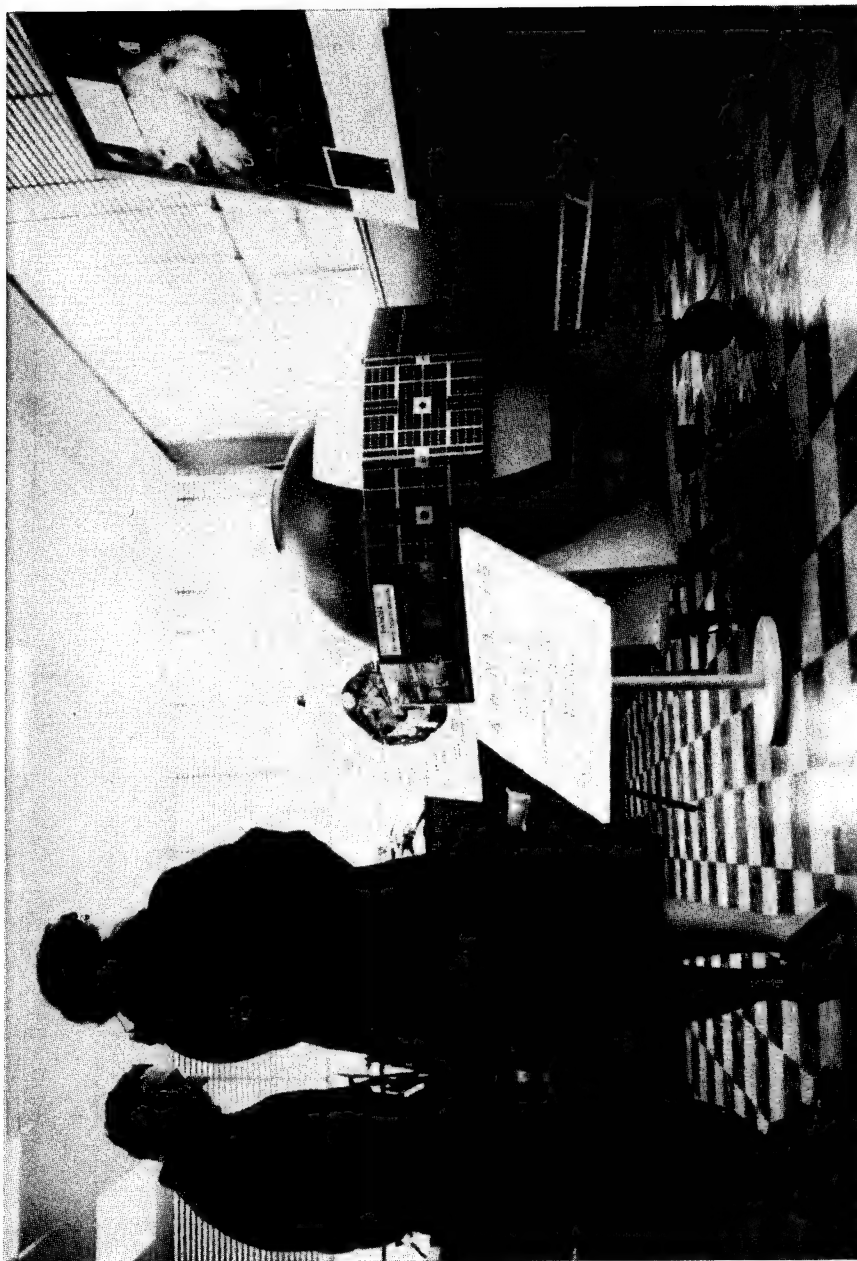
| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|----------------------|---------|---|--|--|
| 28 Jun 1962 | No Name | USAF | H. Yagoda B. Shuman R. Sagalyn L. Katz R. Soberman J. Ulwick | Cosmic Radiation (Nuclear Emulsions) Satellite Magnetic Measurements Ion & Electron Measurements Beta-Gamma Measurements Micrometeorite Detector Electron Density (Impedance Probe) | Success Failure - Satellite Clock Success Success Failure - No Data Success |
| 18 Jul 1962 | Samos 9 (1962-AZ) | USAF | L. Katz | Neutron Albedo Measurements | Success |
| 21 Jul 1962 | No Name (1962-AH) | USAF | R. Sagalyn L. Katz J. Ulwick H. Yagoda | Ion & Electron Measurements Cosmic Ray Monitor Galactic Radio Noise Cosmic Rays (Emulsions & Metals) | Success Success Success Failure No Recovery |
| 28 Jul 62 | No Name | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success Discovered Starfish Caused Increase in Trapped Proton Fluxes |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---------------------------|---------|---|--|--|
| 2 Aug 1962 | No Name (1962-AK) | USAF | J. Ulwick R. Sagalyn L. Katz R. Soberman B. Shuman H. Yagoda | Electron Density (Impedance Probe) Ion & Electron Measurements Beta-Gamma Spectrometric Measurements Micrometeorite Detector Satellite Magnetic Measurements Cosmic Radiation (Nuclear Emulsions) | Telemetry Failure Success Success Telemetry Failure Telemetry Failure Success |
| 29 Aug 1962 | No Name | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| 17 Sep 1962 | None (ERS-2) (1962-AX) | USAF | H. Yagoda J. Ulwick L. Block L. Katz | Cosmic Radiation (Emulsions) Spatial & Temporal Electron Density Variations Earth Infrared Background Cosmic Ray Neutron Flux | Success Success Success Success Environmental Research (ERS) Subsatellite Failed to Eject |
| 9 Oct 1962 | No Name | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|----------------------|---------|--------------------------|--|--|
| 26 Oct 1962 | Starad (1962-BK) | USAF | L. Katz | Trapped Particle Measurements | Success Starfish Artificial Radiation Data Returned Until 1/18/63 Success |
| 31 Oct 1962 | ANNA 1-B | USAF | J. Ulwick O. Williams | Electron Density (Impedance Probe) Project ANNA 1-B (Geodetic Satellite) Strobe Lights | Success |
| 5 Nov 1962 | No Name (1962-BO) | USAF | H. Yagoda | Cosmic Rays (Nuclear Emulsions) | Success |
| 11 Nov 1962 | No Name | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| 24 Nov 1962 | No Name (1962-BP) | USAF | J. Ulwick L. Lovett | Spatial & Temporal Electron Density Variations Infrared Earth Background Measurements | Success |
| | | | | | |



The Anna 1-B Satellite on Display in the AFCRL Lobby

Satellite Experiments - 1958 - Present (cont.)

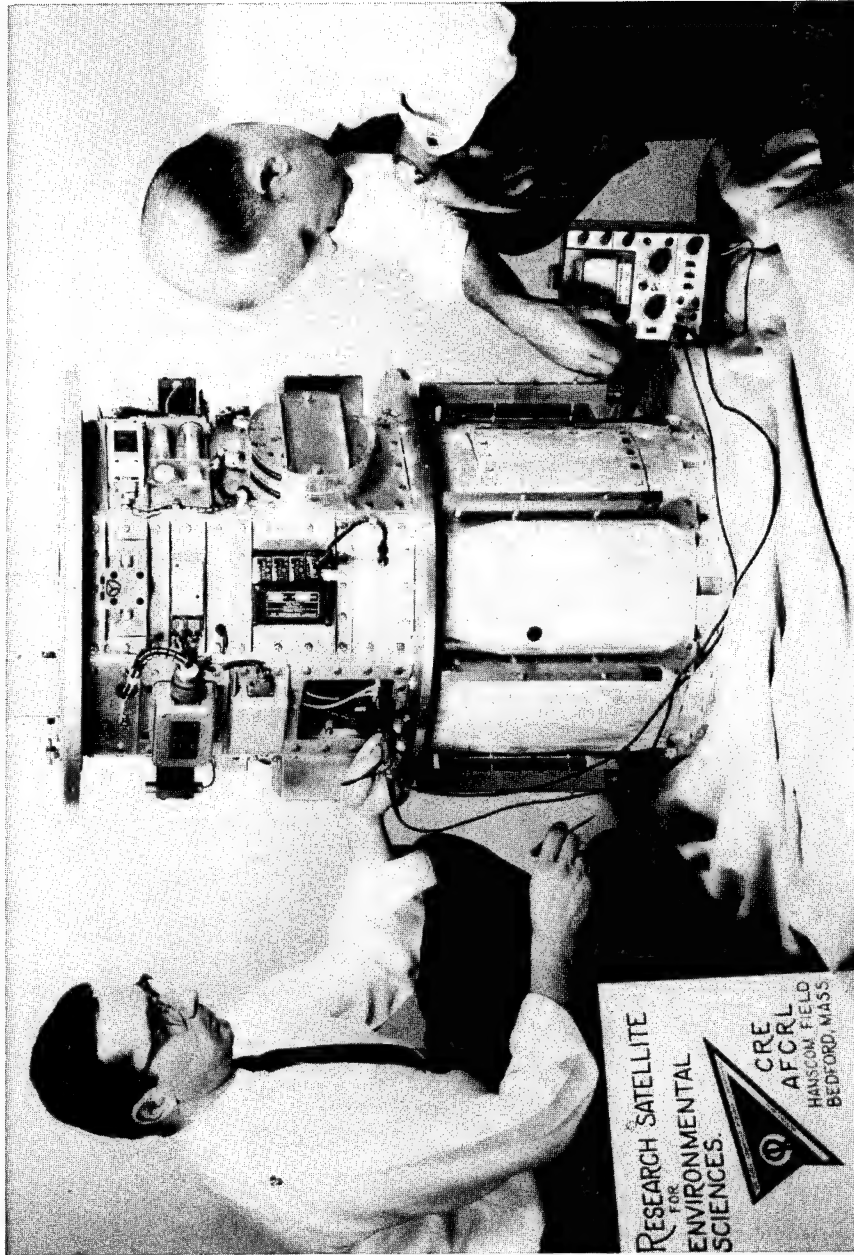
| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|------------------------------------|---------|---------------------|--|---|
| 14 Dec 1962 | None | USAF | H. Yagoda | Cosmic Radiation (Emulsions & Metals) | Success |
| 17 Dec 1962 | None ERS 3&4 | USAF | L. Katz L. Block | Cosmic Ray Studies (CRM-2B) Infrared Measurement of Agena Plume | Failed to orbit Carried Environmental Research Subsatellites |
| 18 Mar 1963 | P-11 | USAF | L. Katz | Cosmic Radiation Subsatellite | Failed to Orbit |
| 1 Apr 1963 | No Name (1963-7A) | USAF | H. Yagoda | Cosmic Radiation Studies (Emulsions) | Success |
| 18 May 1963 | No Name (1963-16A) | USAF | H. Yagoda | Cosmic Radiation Studies (Emulsions) | Success |
| 12 Jun 1963 | No Name (1963-19A) | USAF | H. Yagoda | Cosmic Radiation Studies (Nuclear Emulsions) | Success |
| 27 Jun 1963 | No Name (1963-25A) | USAF | H. Yagoda | Cosmic Radiation Studies (Nuclear Emulsions) | Success |
| 27 Jun 1963 | P-11 (1963-25B) (HITCHHIKER) | USAF | L. Katz | Trapped Energy Particles | Success Returned Radiation Data for More Than 3 Months |
| | | | | | |

Satellite Experiments - 1958 - Present (cont)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---|---------|------------------------------|--|---|
| 28 Jun 1963 | GRS (1963-26A) (Geophysical Research Satellite) | USAF | R. Narcisi H. Hinteregger | Aerospace Composition Retarding Potential Analyzer | Wallops Island Launch on Scout Success Success (Obtained Space Gas Experiment Data for 13 Orbits) |
| 18 Jul 1963 | No Name (1963-28A) | USAF | H. Yagoda | Cosmic Radiation (Emulsions) | Success |
| 31 Jul 1963 | No Name (1963-32A) | USAF | H. Yagoda | Cosmic Radiation (Emulsions) | Success |
| 24 Aug 1963 | No Name (1963-34A) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| 29 Aug 1963 | No Name (1963-35A) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| 23 Sep 1963 | No Name (1963-37A) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| 29 Oct 1963 | No Name (1963-42A) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--|---------|-------------|--|--|
| 21 Dec 1963 | No Name (1963-55A) | USAF | H. Yagoda | Cosmic Radiation (Nuclear Emulsions) | Success |
| 15 Feb 1964 | No Name (1963-8A) | USAF | R. Filz | Cosmic Radiation (Nuclear Emulsions) | Success |
| 21 Apr 1964 | No Name | USN | J. Mullen | ORBIS I (Orbiting Ionospheric Beacon) | Failed to Orbit |
| 4 Jun 1964 | No Name (1963-26A) | USAF | R. Filz | Cosmic Radiation (Emulsions) | Success |
| 13 Jun 1964 | No Name (1964-30A) | USAF | R. Filz | Cosmic Radiation (Emulsions) | |
| 18 Jun 1964 | No Name (1964-31A) | USAF | R. Filz | Cosmic Radiation (Emulsions) | Success |
| 26 Jun 1964 | Research Satellite for Environmental Sciences | USAF | | | Scout, Launched from Western Test Range, Failed to Orbit |
| 10 Jul 1964 | No Name (1964-37A) | USAF | R. Filz | Cosmic Radiation (Emulsions) | |
| | | | | | |



Checking Instrumentation Signals on the AFCRL Research Satellite for Environmental Sciences, 1964.

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---|---------|---|--|---|
| 5 Sep 1964 | OGO-A (1964-54A) (Orbiting Geophysical Observatory) | NASA | R. Sagalyn | Positive & Negative Ion & Proton Fluxes & Energies | Eastern Test Range Launch Success |
| 2 Nov 1964 | No Name | USAF | R. Filz | Cosmic Radiation (Emulsions) | Success |
| 18 Nov 1964 | No Name | USAF | J. Mullen | ORBIS II (Orbiting Ionospheric Beacon) | Success |
| 21 Nov 1964 | Injun IV (1964-76B) (Explorer 25) | NASA | R. Sagalyn | Positive & Negative Ions (Ion Trap) | Dual-Payload Launch Successful Experiment |
| 11 Dec 64 | Atlas-Centaur 4 (1964-82A) | NASA | H. Hinteregger L. Block | Retarding Potential Analyzer Centaur Plume Measurements | Success Failure (Centaur Payload) |
| 21 Jan 1965 | Orbiting Vehicle (OV1-1) | USAF | L. Block R. Soberman J. Ulwick J. Ulwick | IR-UV Radiation (Radiometers) Micrometeorite Detector Radio Noise (Radiometer) Impedance Probe | Failure--No Separation of Orbiting Vehicle from Side Pad of ABRES Vehicle |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--|--------------|--|--|---|
| 25 Feb 1965 | No Name (1965-13A) | USAF | R. Filz | Cosmic Radiation (Emulsions) | Success |
| 3 Apr 1965 | 1965-27A and B (Snapshot/Secor 4) | USAF/ USA | J. McIsaac R. Sagalyn J. Ulwick R. Soberman | Atmospheric Density (Gauges) Electrical Structure Impedance Probe Micrometeorite Detector | Success Success, Success Success |
| 18 May 1965 | No Name (1965-37A) | USAF | R. Filz | Cosmic Radiation (Nuclear Emulsions) | Success |
| 17 Aug 1965 | No Name (1965-67A) | USAF | R. Filz | Cosmic Radiation (Nuclear Emulsions) | Success |
| 21 Aug 1965 | Gemini V (1965-68A) | NASA | J. Lovett | Radiometric Measurements | Success |
| 25 Aug 1965 | OSO-C (Orbiting Solar Observatory) | NASA | H. Hinteregger | EUV Monochromator | Failed to Orbit |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------------------|---------|---|--|--|
| 2 Sep 1965 | No Name | USAF | M. Wong J. Aarons J. Ulwick L. Block | Satellite to Satellite Communications Exospheric Radiation Radio Noise IR-UV Optical Measurements | Failed to Orbit |
| 22 Sep 1965 | No Name (1965-74A) | USAF | R. Filz | Cosmic Radiation (Nuclear Emulsions) | Success |
| 14 Oct 1965 | OGO-2 (1965-81A) | NASA | H. Hinteregger D. Bedo | XUV Spectrophotometer | Partial |
| 15 Oct 1965 | OV2-1 (LCS-2) (1965-82A) | USAF | L. Katz | Trapped Radiation Measurements | ETR Launch Vehicle Failure |
| 4 Dec 1965 | Gemini 7 (1965-100A) | NASA | J. Lovett | Radiometric Measurements | Success |
| 9 Dec 1965 | No Name (1965-102A) | USAF | R. Filz | Cosmic Radiation (Nuclear Emulsions) | Success |
| 21 Dec 1965 | OV2-3 | USAF | B. Shuman R. Sagalyn L. Katz | Magnetic Fields Electrical Structure Cosmic Radiation Studies | ETR Launch Transtage Separation Failed |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-----------------------|---------|---|--|--|
| 9 Mar 1966 | No Name (1966-18A) | USAF | R. Filz | Cosmic Radiation | Success |
| 30 Mar 1966 | OV1-5 (1966-25B) | USAF | J. Lovett | UV-visible-11IR Radiation Satellite (3 Radiometers & 2 Interferometers) | Success |
| 7 Apr 1966 | No Name (1966-29A) | USAF | R. Filz | Cosmic Radiation | Success |
| 22 Apr 1966 | OV3-1 (1966-34A) | USAF | L. Katz L. Katz L. Katz R. Sagalyn | Proton Measurements (Spectrometer) Electron Measurements (Spectrometer) Low Energy Electrons (Electrostatic Analyzer) Plasma Probes | Success Success Success Success |
| 24 May 1966 | No Name (1966-42A) | USAF | R. Filz | Cosmic Radiation | Success |
| 21 Jun 1966 | No Name (1966-55A) | USAF | R. Filz | Cosmic Radiation | Success |
| 13 Jul 1966 | OV1-7 | USAF | J. Ely | Cosmic Radiation Satellite Experiment | Vehicle Failure |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

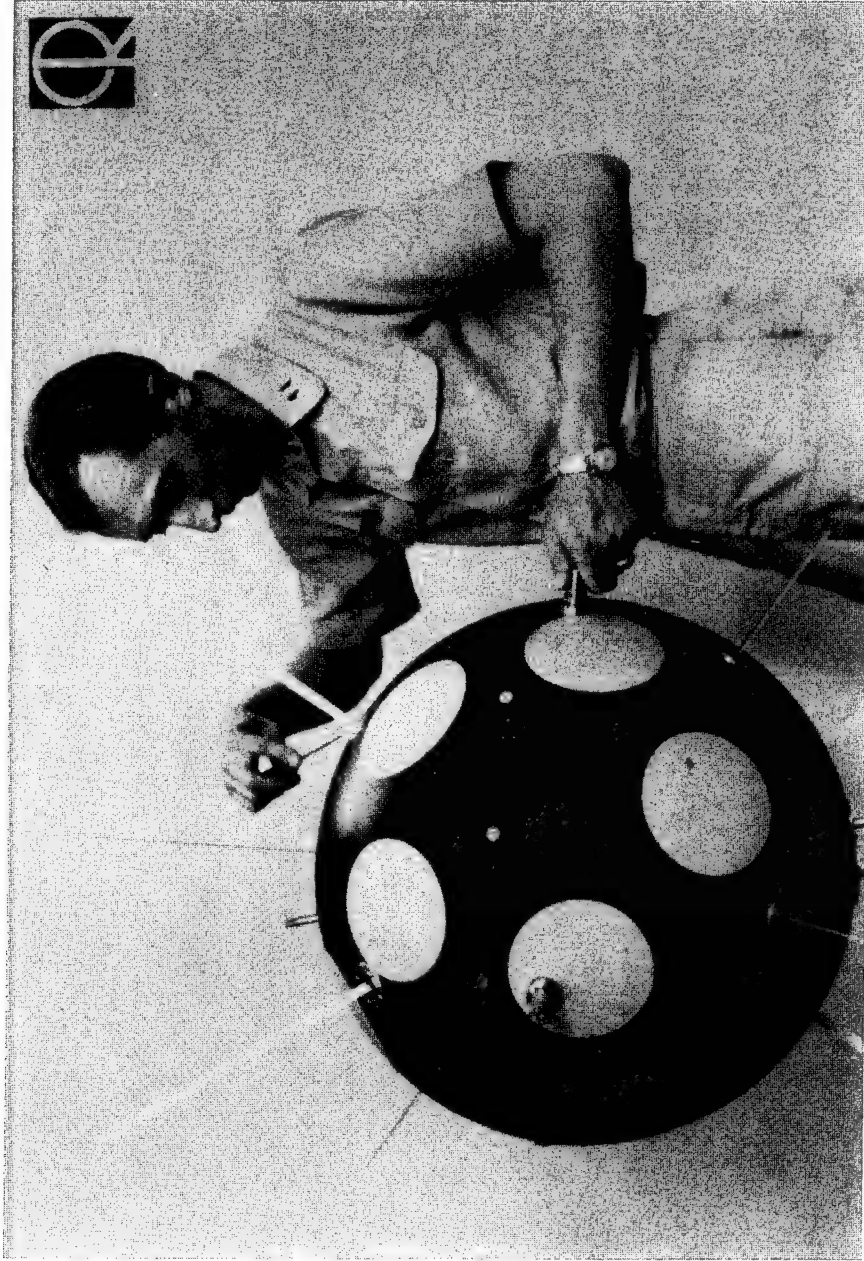
| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-------------------------|---------|--|---|---|
| 18 Jul 1966 | Gemini 10 (1966-66A) | NASA | R. Sagalyn | Ion Attitude Sensors | Success |
| 9 Aug 1966 | No Name (1966-72A) | USAF | R. Filz | Trapped Radiation | Success |
| 28 Oct 1966 | OV3-2 (1966-97A) | USAF | J. Ulwick J. Ulwick H. Cohen M. Smiddy J. Sandock | RF Probe Electrostatic Analyzer Quadrupole Mass Spectrometer Plasma Probe Retarding Potential Analyzer | Success Success Success Success Success |
| 11 Nov 1966 | Gemini 12 | NASA | R. Sagalyn | Ion Attitude Sensors | Great Success After Fuel Cells Malfunctioned, Ion Sensors Were Used to Realign Gemini for Operations & Reentry |
| 11 Dec 1966 | OV1-9 | USAF | J. Aarons L. Katz V. Smalley V. Smalley V. Smalley V. Smalley V. Smalley | Exospheric Proton Gyrofrequency Electrostatic Analyzer Geiger Counter Electron Magnetic Analyzer Proton Spectrometers Electron Spectrometer Proton Range Energy Telescope | Success Partial Success Partial Success Success Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------|---------|---------------------------------------|--|---|
| 11 Dec 1966 | OV1-10 | USAF | J. Ely R. Hutchinson | Heavy Primary Detector Magnetic Field Measurements | Success Failure |
| 31 Jan 1967 | OV3-5 (ATCOS I) | USAF | R. Narcisi J. Ulwick J. McIsaac | Mass Spectrometers (2) Ion Density Gauge (3) Impedance Probe | AFCRL-Built Failed to Orbit |
| Mar 1967 | OSO-III | USAF | H. Hinteregger L. Hall | Monochromator for Solar EUV | Eastern Test Range Launch Success |
| 28 Apr 1967 | OV5-1 | USAF | G. Yates | Magnetospheric Experiments | Success |
| 4 Jun 1967 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 27 Jul 1967 | OV1-86 | USAF | J. Lovett V. Smalley | Earth & Cloud IR/Cosmic Radiation Atomic Oxygen | Success Success |
| 28 Jul 1967 | OGO-4 | NASA | H. Hinteregger D. Bedo | Solar EUV Radiation (Spectrometer) | Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---------------------|---------|--|--|---|
| 5 Dec 1967 | OV3-6 (ATCOS II) | USAF | R. Narcisi J. Ulwick 'J. McIsaac | Latitudinal Variations in Neutral & Ion Species Electron Density & Temperature Atmospheric Density | AFCRL-Built Success |
| 9 Dec 1967 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 24 Jan 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 4 Mar 1968 | OGO-5 | NASA | R. Sagalyn | Charged Particles at 0-2.5 keV | Success |
| 14 Mar 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 30 Mar 1968 | OV1-13 | USAF | L. Katz | Trapped Radiation Flux | Success |
| 1 May 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 20 Jun 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 11 Jul 1968 | OV1-15 OV1-16 | USAF | R. Philbrick K. Champion K. Champion | SPADES - Mass Spectrometer & Accelerometer Cannonball I - Density Accelerometer | Launched Together Success Low Altitude Density Research Satellites |
| 7 Aug 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| | | | | | |



Installing Antennas on the Cannonball I Satellite (OV1-16).

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------------|---------|-------------------------------------|---|---|
| 8 Aug 1968 | Explorer 40 (Injun V) | NASA | R. Sagalyn | Charged Particles & Electron Fields | Success |
| 18 Sep 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 26 Sep 1968 | OV2-5 | USAF | B. Shuman J. Mullen M. Smiddy | Geomagnetic Storms/ Ionospheric Scintillations/ Composition | Success |
| 3 Nov 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 12 Dec 1968 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 5 Feb 1969 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 18 Mar 1969 | OV1-17 OV1-17A | USAF | A. Barnes J. Mullen | Calibration of Meteor Trail Antenna Calibration of Entrapped Radio Signals in the Ionosphere | ETR Launch Success Transmitted Data Until 1976 |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-----------|---------|----------------|---|----------|
| 2 May 1969 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 23 May 1969 | OV5-6 | USAF | K. Yates | Solar X-rays & Particle Radiation Experiments | Success |
| 5 Jun 1969 | OGO-6 | NASA | H. Hinteregger | UV Solar Radiation (Spectrophotometer) | Success |
| 16 Jul 1969 | Apollo 11 | NASA | D. Eckhardt | Lunar Laser Ranging Experiment | Success |
| | | | D. Eckhardt | Backup Retroreflectors | Not Used |
| 24 Jul 1969 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 22 Sep 1969 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 4 Dec 1969 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 4 Mar 1970 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 20 May 1970 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 23 Jul 1970 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 18 Nov 1970 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-----------------------|---------|--|---|--|
| 7 Aug 1971 | OV1-20 | USAF | K. Champion | Cannonball II Satellite Low-Altitude Density Experiment (Accelerometer) | OV1-20 & OV1-21 Payloads Launched in Tandem on an Atlas F All Experiments Successful |
| 7 Aug 1971 | OV1-21 | USAF | K. Champion | (1) Musketball Satellite Low-Altitude Density Experiment (Radar Tracking Beacon) | |
| | | | R. Narcisi C. Philbrick J. McIsaac | (2) DENPER Satellite Velocity Mass Spectrometer Magnetic Mass Spectrometer Ionization Gauges | |
| 19 Apr 1972 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 25 May 1972 | No Name | USAF | R. Filz | Cosmic Radiation | Success |
| 2 Oct 1972 | No Name (STP72-1) | USAF | L. Katz | Proton & Alpha Isotope Detector | Success |
| 16 Dec 1973 | Explorer 51 (AE-C) | NASA | H. Hinteregger F. Marcos | Solar EUV (Spectrometer) Density (Tri-Axial Accelerometer) | Success Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|-------------------------|------------|---|--|---|
| 1974 | S3-1 | USAF (STP) | LK F. Marcos C. Philbrick | Single-Axis & Piezoelectric Accelerometers Ionization Gauge/Neutral Mass Spectrometer | Success Success |
| 1975 | S3-2 | USAF (STP) | LK C. Philbrick F. Marcos PH LI | Neutral Mass Spectrometer/ Ionization Gauge Piezoelectric Accelerometer Electric Field, Magnetic Field Auroral Particles, Thermal Plasma | Success Success Success |
| 6 Oct 1975 | Explorer 54 (AE-D) | NASA | LK H. Hinteregger K. Champion | Solar EUV (Spectrometer) Density (Tri-Axial Accelerometer) | Success Success |
| 20 Nov 1975 | Explorer 55 (AE-E) | NASA | LK H. Hinteregger K. Champion | Solar EUV (Spectrometer) Density (Tri-Axial Accelerometer) | Success Satellite Functional Until 6/10/81 |
| 15 Mar 1976 | SOLRAD11A SOLRAD 11B | USAF | PH L. Katz | Protons & Alpha Particles | Satellites Launched Together Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|------------------------------------|------------|-------------------------------|---|--------------------------|
| May 1976 | S3-3 | USAF (STP) | PH | Thermal Plasma | Success |
| 4 May 1976 | LAGEOS Laser Geodetic Satellite | NASA | D. Eckhardt | Concept Review & Specification-Panel Member | Passive Reflector System |
| 11 Sep 1976 | AMS1 (DMSP) | US | PH | Defense Meteorological Satellite Program (DMSP) Electrostatic Analyzers (SSJ/2) | WTR Launch Success |
| 14 Jan 1977 | No Name (1977-02A) | USAF | PH R. Filz | Trapped Radiation | Success |
| Jun 5 1977 | DMSP-F2 | USAF | PH P. Rothwell | Electrostatic Analyzers (SSJ/3) | WTR Launch Success |
| Mar 1978 | S3-4 | USAF (STP) | LK R. Huffman F. Marcos | UV Backgrounds Sensor Density Accelerometers | Success Success |
| 1 May 1978 | DMSP-F3 | USAF | PH P. Rothwell | Electrostatic Analyzers (SSJ/3) | WTR Launch Success |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------|---------------|---------------------------|---|---|
| 1979 | SETA 1 | USAF | LK F. Marcos | Density-Triaxial Accelerometer | Success Provided Accurate Satellite Positioning Techniques |
| 30 Jan 1979 | SCATHA (P78-2) | USAF/ NASA | PH C. Pike H. Cohen | Electric Fields Particle Flux Monitors Active Discharging Devices | Success Spacecraft Charging at High Altitudes |
| 25 Feb 1979 | Solwind (P78-1) | USAF | PH R. Vancour | Electron Detectors (Electrostatic Analyzers) | Success Target for USAF ASAT6 13 Sep 1985 |
| 6 Jun 1979 | DMSP-F4 | USAF | PH D. Hardy F. Rich | SSJ/3 Sensor Special Sensor Ions & Electrons (SSIE) | Success |
| 14 Feb 1980 | SMM | NASA | PH | Participation in Experiments | Solar Maximum Mission |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

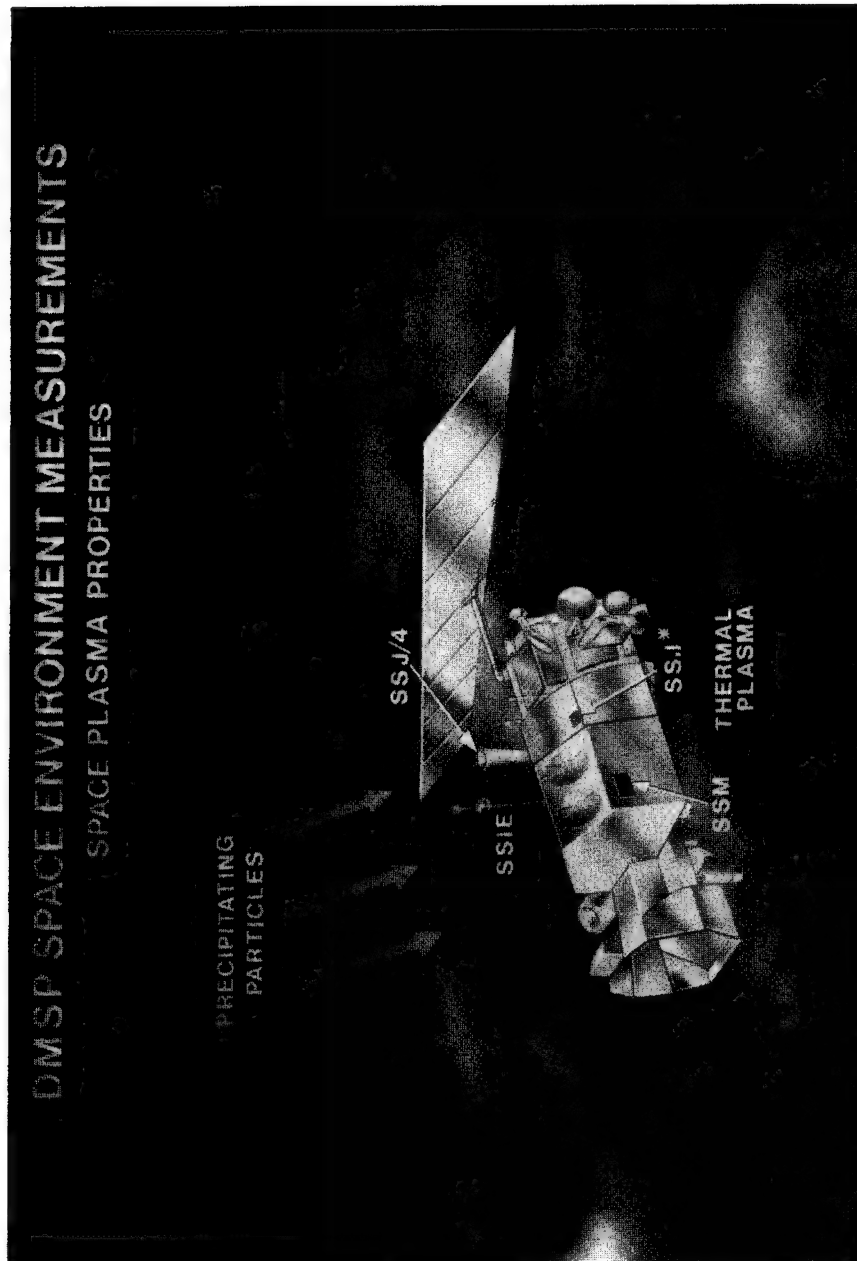
| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---------|---------|---|---|---|
| 14 Jul 1980 | DSMP-F5 | USAF | PH D. Hardy F. Rich | SSJ/3 SSIE | Launch Vehicle Failure |
| 1982 | SETA-2 | USAF | LK F. Marcos | Density - Triaxial Accelerometer | Success |
| 21 Dec 1982 | DMSP-F6 | USAF | PH D. Hardy F. Rich | Electrostatic Analyzers (SSJ/4 Special Sensor Ions & Electrons (SSIE) | Success Satellite Taken Out of Service Aug 1987 |
| 1983 | SETA-3 | USAF | LK F. Marcos | Triaxial Accelerometer | Success |
| 27 Jun 1983 | HILAT | DNA/SD | LK R. Huffman PH D. Hardy F. Rich | Auroral Ionospheric Mapper SSJ/3 Plasma Measurements Package | High-Latitude Satellite |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|------------|---------|---------------------------|---|--|
| 18 Nov 1983 | DMSP-F7 | USAF | PH F. Rich D. Hardy | SSIE, SSJ/4, Fluxgate Magnetometer (SSM) & Dosimeter (SSJ*) | Success Satellite Ceased Operating Mar 1988 |
| 1984 | S85-1 | USAF | LI F. Marcos | Triaxial Accelerometer-Density | Success |
| 13 Nov 1986 | POLAR BEAR | DNA | LI R. Huffman | Auroral/Ionospheric Remote Sensor (AIRS) | Success |
| 19 Jun 1987 | DMSP-F8 | USAF | PH D. Hardy F. Rich | SSJ/4 Electron Flux SSIES Plasma Monitor | Functioning in Orbit |
| 3 Feb 1988 | DMSP-F9 | USAF | PH D. Hardy F. Rich | SSJ/4 SSIES Sensors | Success Satellite Failure April 1992 |
| 14 Feb 1990 | RME/LACE | SDIO | OP R. Beland | Relay Mirror Experiment | Optical Turbulence Support Studies |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|---------|---------------|-------------------|--|--|
| 25 Jul 1990 | CRRES | USAF/ NASA | PH E.G. Mullen | <u>18 SPACERAD Experiments</u> Microelectronics Package Internal Discharge Monitor Dosimeter MOS Dosimeter High Energy Electron Spectrometer Medium Energy Electron Spectrometer Medium Energy Electron/Proton Spectrometer Low Energy Plasma Analyzer Range Telescope Proton Switches Proton Telescope Magnetospheric Ion Composition Spectrometer Low Energy Magnetospheric Ion Composition Spectrometer Heavy Ion Telescope Fluxgate Magnetometer Search Coil Magnetometer Thermal Plasma Probe Passive Plasma Sounder | Combined Release/Radiation Effects Mission Successful Launch Data Obtained From All Experiments Except the Heavy Ion Telescope & the Low Energy Magnetospheric Ion Composition Spectrometer Data From These Last Two Were Limited Satellite Power Supply Failed 12 Oct 1991 |
| | | | | | |



The Complement of AFGL Sensors on DMSP F-7

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|--------------------|-----------|----------------------------|-------------------------------|---|
| 25 Jul 1990 | CRRES | USAF/NASA | LI D. Hunton | Mass Spectrometer (LASSII) | Obtained Partial Data |
| 1 Dec 1990 | DMSP-F10 | USAF | PH D. Hardy F. Rich | SSJ/4 SSIES Sensors | Functioning in Orbit |
| 28 Nov 1991 | DMSP-F11 | USAF | GPS D. Hardy F. Rich | SSJ/4 SSIES Sensors | Functioning in Orbit |
| 22 Nov 1992 | MST1-1 | SDIO | SXA | Miniature Sensor Technology | Scout-Launched Integration & Test Support |
| 8 May 1994 | MST1-2 | BMDO | SXA | Miniature Sensor Technology | Scout-Launched Integration & Test Support |
| 27 Jun 1994 | ADS (AF STEP-1) | USAF | GPI F. Marcos | Atmospheric Density Satellite | Pegasus XL Launch from an L-1011 Launch Failure |
| | | | | | |

Satellite Experiments - 1958 - Present (cont.)

| Date of Launch | Vehicle | Sponsor | Division/PI | Payload/Experiments | Comments |
|----------------|------------------|---------|------------------------------------|--|---|
| 3 Aug 1994 | APEX (STEP-2) | USAF | GPS D. Guidice P. Severance | Photovoltaic Array Space Power Plus Diagnostics (PASP <i>Plus</i>) Experiment | Success Standard Pegasus Launch from a B-52 |
| 29 Aug 1994 | DMSP-F12 | USAF | GPS F. Rich M.S. Gussenhoven | SSIES-2, SSJ4, SSM Sensors | Successful Launch |
| 1 Nov 1994 | WIND | NASA | GPS E. Cliver | Solar Wind Interplanetary Measurements (SWIM) Experiment | Successful Launch |
| | | | | | |

AFGL/Phillips Lab-Hanscom Space Shuttle Experiments, 1982 - Present*

*As of November 1994

| Date of Launch | Vehicle | Division/PI | Payload/Experiments | Comments |
|----------------|----------------|--|--|--|
| | | OP D. Smith LC R. Wilton LK - PH R. Huffman R. Narcisi F. Rich R. Huffman M. Smiddy | Cryogenic IR Radiance Instrumentation for Shuttle (CIRRIS 1) <u>On the Secondary Experiments Test Sets (SETS-1) Pallet</u> UV Spectrometer Mass Spectrometer Energetic Particle Detector Electron Spectrometer Electric Fields Plasma Sensors | CIRRIS 1 Instrument Cover Failed to Open SETS-1 Instruments Obtained Data Mass Spectrometer Reflow on STS-46 |
| 28 Nov 1983 | Columbia STS-9 | PH C. Pike W. Denig R. Viereck | Auroral Photography Experiment (APE) | No data APE Was Reflowed & Obtained Data on Nine Subsequent Shuttle Missions (STS-17, 29, 33, 38, 41, 43, 52, 60, & 62) |
| | | | | |

AFGL/Phillips Lab-Hanscom Space Shuttle Experiments, 1982 - Present (cont.)

| Date of Launch | Vehicle | Division/PI | Payload/Experiments | Comments |
|----------------|---------------------------------|--------------------|---|--|
| 6 Apr 1984 | Challenger STS-41C | PH F. Rich | <u>Under the Long Duration Exposure Facility</u> Cosmic Ray Experiment Materials Experiment | Retrieved 12 Jan 1990 |
| 30 Aug 1984 | Discovery STS-14 | LY W. Snow | CLOUDS Photography Experiment | CLOUDS Was Flown Again on Five Later Missions (STS-20, 21, 27, 28, & 33) Data Obtained on All Flights |
| 29 Jul 1985 | Challenger STS 51F (Spacelab 2) | PH G. Simon | Solar Optical Universal Polarimeter (SOUP) | Partial Success George Simon was Alternate Payload Specialist for the Spacelab 2 mission |
| 3 Oct 1985 | STS-51J | OP M. Ahmadjian | Measurement of Atmospheric Radiance Camera, Day/Night (MARC-D/N) | Success Obtained Data |
| | | | | |

AFGL/Phillips Lab-Hanscom Space Shuttle Experiments, 1982 - Present (cont.)

| Date of Launch | Vehicle | Division/PI | Payload/Experiments | Comments |
|------------------------|------------------|--|---|--|
| 12 Jan 1986 | Columbia STS-61C | OP M. Ahmadjian | Particle Analysis Cameras for Shuttle (PACS) | NASA Hitchhiker Payload Success |
| 14 Mar 1989 | STS-29 | PHK E. Murad D. Knecht. E. Murad | AMOS Calibration Test | Reflown on 7 Subsequent Shuttle missions (STS 30, 33, 38, 41, 43, 44, and 56) Data Obtained on All Flights |
| 28 Apr 1991 (cont.) | Discovery STS-39 | OP R. Nadile LI R. Huffman LI D. Hunton PHK E. Murad D. Knecht | <u>Under AFP-675 Payload</u> Cryogenic IR Radiance Instrumentation for Shuttle (CIRRIS-1A) Horizon Ultraviolet Program (HUP) Quadrupole Ion Neutral Mass Spectrometer (QINMS) <u>Under the IBSS Payload</u> Arizona Imaging Spectrometer (AIS) Critical Ionization Velocity (CIV) Experiment | Mission Success Obtained Data Partial Data Partial Data Obtained Data Obtained Data |
| | | | | |



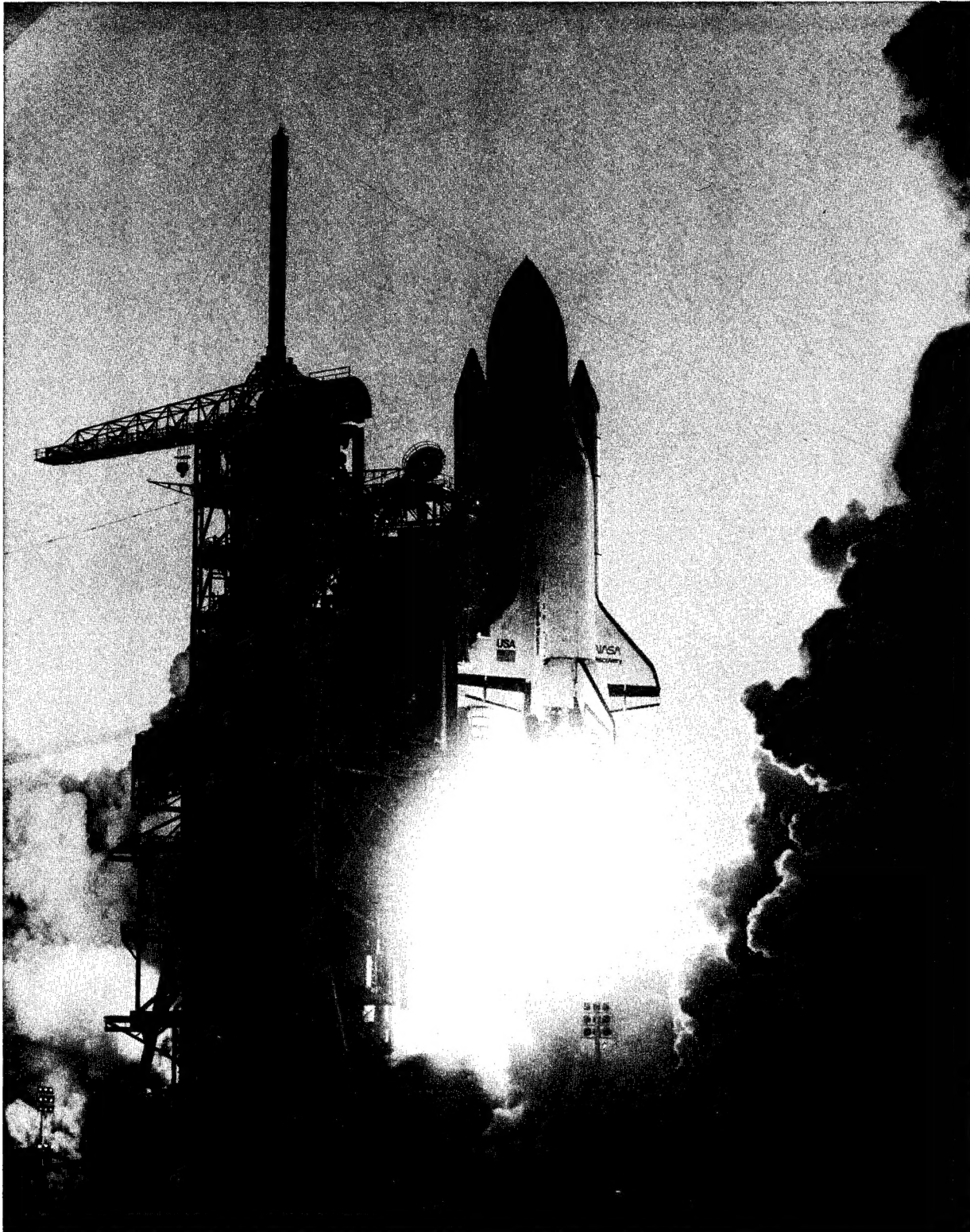
CLOUDS Photography: The Vertical Stabilizer of the Space Shuttle Dips over Maui, Hawaii, Where Cumulus Clouds Have Formed Above the Land Mass.

AFGL/Phillips Lab-Hanscom Space Shuttle Experiments, 1982 - Present (cont.)

| Date of Launch | Vehicle | Division/PI | Payload/Experiments | Comments |
|------------------------|------------------|--|---|--|
| 28 Apr 1991 (cont.) | Discovery STS-39 | PHK W. Denig OP R. Van Tassel LC W. Thorn R. McInerney | <u>Under the IBSS Payload (cont.)</u> Pressure Gauge IBSS IR Sensor Data LLTV Cameras IBSS Data Reduction <u>Under the STP-1 Payload</u> | Obtained Data Obtained Data Obtained Data Obtained Data |
| 22 Jan 1992 | STS-42 | OP M. Ahmadjian | Spacecraft Kinetic IR Test (SKIRT) Experiment | Obtained Data |
| | | GPO SXA P. LeVan | Visual Photometric Experiment (VIPER) | Get Away Special |
| | | | | |

AFGL/Phillips Lab-Hanscom Space Shuttle Experiments, 1982 - Present (cont.)

| Date of Launch | Vehicle | Division/PI | Payload/Experiments | Comments |
|----------------|-----------------|---|---|--------------------------------|
| 31 Jul 1992 | STS-46 | GPS M. Oberhardt D. Hardy | <u>Under Tethered Satellite (TSS-1) Payload</u> Shuttle Potential and Return Electron Experiment (SPREE) | Tether Failure Limited Data |
| | | GPI D. Hunton | <u>Under the EOIM-III Payload</u> Quadrupole Mass Spectrometry Experiment | Fully Successful |
| Dec 1992 | STS-53 (STP) | WSSI E. Murad D. Knecht R. Viereck | Shuttle Glow Experiment (GLO) | Success Obtained Data |
| 3 Feb 1994 | STS-60 | GPS L. Enloe M. Violet | Charging Hazards and Wake Studies (CHAWS) | Success Obtained Data |
| 4 Mar 1994 | STS-62 | GPO M. Ahmadjian | Spacecraft Kinetic IR Test Experiment (SKIRT-2) | Success Obtained Data |
| | | | | |



The Launch of the Space Shuttle Discovery (STS-39), 28 April, 1991. STS-39 Carried CIRRIS 1A and Nine Other Phillips Lab/Hanscom Experiments.

NASA Photo